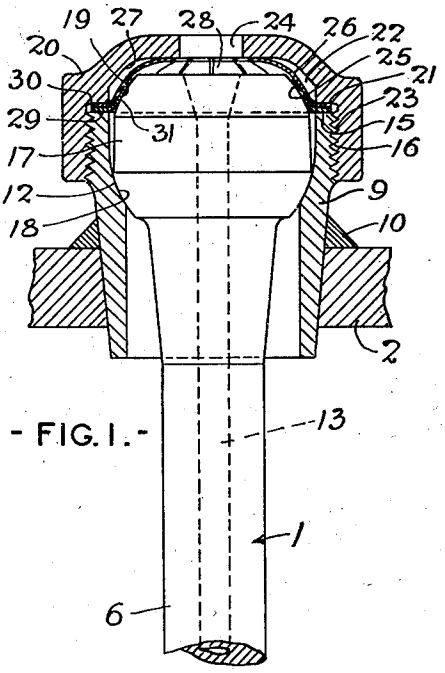
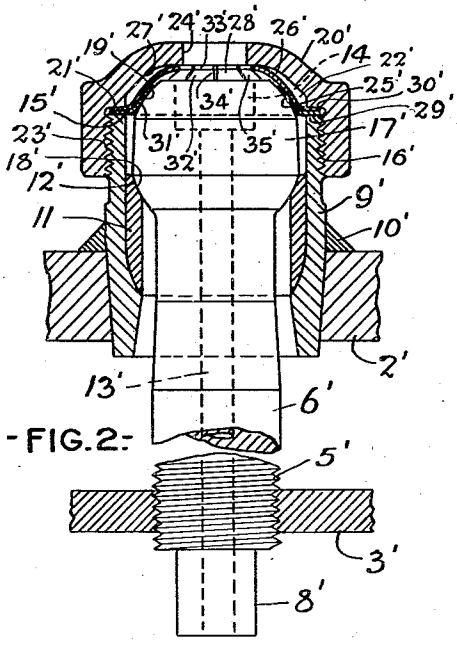
Aug. 21, 1945. J. KINDERVATER 2,383,394

FLEXIBLE HOLLOW STAYBOLT CONSTRUCTION FOR BOILERS

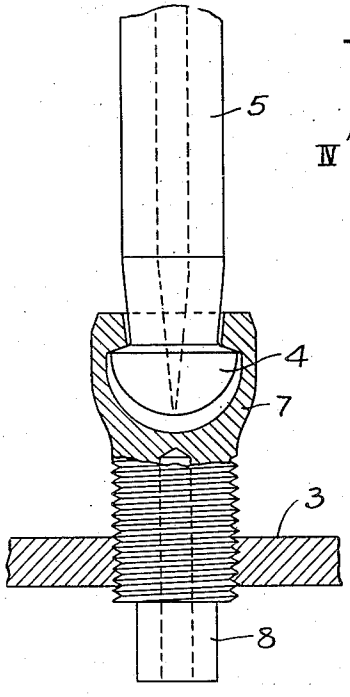
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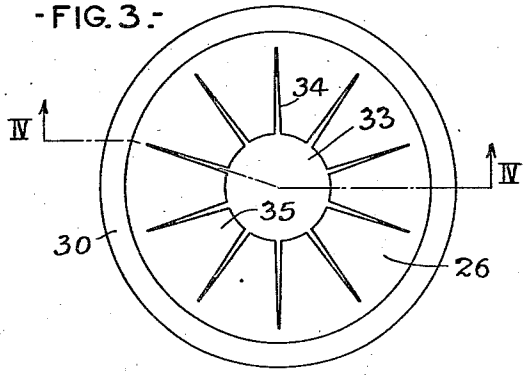
- FIG. 1. -



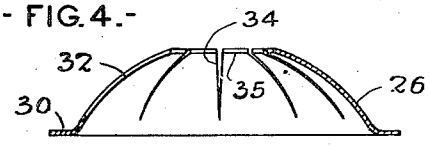
- FIG. 2. -



- FIG. 3. -



- FIG. 4. -



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Patented Aug. 21, 1945

2,383,394

UNITED STATES PATENT OFFICE

2,383,394

FLEXIBLE HOLLOW STAY-BOLT CONSTRUCTION FOR BOILERS

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Application July 20, 1944, Serial No. 545,815

4 Claims. (Cl. 85—1.5)

This invention relates to flexible hollow staybolt constructions for boilers, and more particularly to a connection for flexibly securing the staybolt to the outer boiler sheet. The construction is of the type having a capped sleeve with an interior spherically-shaped seat adapted to be secured to the outer boiler sheet, and a staybolt terminating at its outer end in a spherically-shaped head supported on the seat providing a flexible joint between the staybolt and sleeve.

The object of the invention is to provide a flexible gasket snugly engaging the outer end of the spherically-shaped head and a flexible spring clamp holding the gasket in sealed engagement with the head during all relative movements between the head and sleeve while in service, the gasket and clamp, at their outer margins, being tightly secured between the sleeve and cap, thereby providing a sealed joint between the head and sleeve.

Other and further objects of this invention will appear from the following description, the accompanying drawing and the appended claims.

Referring to the drawing forming a part of this application, Figure 1 is a foreshortened central sectional view, partly in elevation, of an embodiment of the present invention, portions of the boiler sheets being shown in section; Fig. 2 is a similar view of a different type of staybolt construction showing a slightly modified form of the present invention; Fig. 3 is an enlarged plan of the clamp when not under compression; and Fig. 4 is a section of the clamp on the line IV—IV of Fig. 3.

The inner end of the construction, which is secured to the firebox or inner boiler sheet, forms no part of the present invention, and any appropriate preferred or well-known type may be employed.

Referring to Fig. 1, the staybolt construction is indicated generally by the reference numeral 1 and is shown connected to the fragmentally shown outer boiler sheet 2 and inner boiler sheet 3. The construction, at the inner end, which is conventional, as aforesaid, provides a flexible connection at this end. It comprises a head 4 disposed at the inner end of the body 5 of the staybolt 6. The head is seated in the hollow of the member 7 which is threaded and secured in the threaded orifice of the inner boiler sheet 3 and is provided with a squared end 8 for a wrench for drawing the staybolt 6 in place in the usual manner. The wall of the hollow of the member 7, when first formed, is flared sufficiently outward to permit the head 4 to be assembled, and thereafter is closed up as shown, and according to usual practice.

In the modified form shown in Fig. 2 the inner end of the staybolt 6' is made differently but is also conventional. The inner end of the body 5' is threaded and secured in the threaded orifice of the inner boiler sheet 3', providing a rigid joint between the staybolt 6' and the inner boiler sheet 3', instead of a flexible joint as in Fig. 1. The staybolt 6' is provided with a squared inner end 8' similar to the staybolt of Fig. 1, and when the staybolts of each type are assembled in the boiler sheets these squared ends are removed and the end of the member 7 and staybolt 6', as the case may be, is rivetted over tightly against the respective inner boiler sheets 3 and 3' in the usual manner.

The connection at the outer end of the construction of Fig. 2 for the outer boiler sheet 2' is intended for a conventional sleeve of any appropriate type so that, if desired, the invention may be employed where the sleeve has previously been connected to the boiler sheet and has been used with another type of construction and where it is desired to change over to a construction of the present type. For illustrative purposes a conventional sleeve 9' is chosen of the type having a conical lower exterior face engaging a conical orifice in the boiler sheet and welded thereto by a fillet weld 10'.

A head is provided at the outer end of the staybolt body 5', as will later appear, and a characteristic of the invention is that the heads of both staybolt 6 and staybolt 6' project outwardly beyond the outer face of their respective sleeves. To provide for this in the case of the conventional sleeve 9', a filler piece ring 11 having an interior concave spherically-shaped seat 12' for the staybolt head is fitted in the sleeve, as clearly shown, and is of a suitable height to seat the head so that it will extend beyond the sleeve, as aforesaid. The staybolts are of the tell-tale type, the bolt 6' being provided with a longitudinal bore 13' extending throughout the length of the staybolt and open at both ends so that it may be cleaned of rust or other foreign matter from either end, preferably the firebox end which may be closed, as by a removable porous plug (not shown) in the usual manner, if desired. The bore, at the opposite or outer end, if desired, may be enlarged and squared as shown at 14 for the application of a tool for screwing the staybolt to the inner boiler sheet 3', in which case the squared end 8' may be eliminated.

In other particulars the connections of the con-

structions of Figs. 1 and 2 are similar and a description of the connection shown in Fig. 1 will suffice, corresponding parts of the construction shown in Fig. 2 being indicated by similar reference numerals with accents added.

Referring to Fig. 1, a sleeve of any appropriate type may be employed but for illustrative purposes a sleeve 9 is employed of the general type of the sleeve 9' having its lower exterior portion conically-shaped for mounting it, as shown, in a corresponding conically-shaped orifice in the boiler sheet 2 to which it is secured by a fillet weld 10. The sleeve is provided with an interior concave spherically-shaped seat 12 for the staybolt head, later to be described, and at its outer end has a flat seat 15 and inward thereof an externally threaded portion 16.

The staybolt 6 at the outer end of the body 5 is provided with a head 17 and a longitudinal bore 13 for a similar purpose as bore 13' except that bore 13, while open through the head 17, is closed at its opposite end (when the opposite end is of the type shown) so that it can be cleaned only through the open end at the head 17.

The head 17, at its inner end portion, has a convex spherically-shaped face 18 engaging the seat 12, and at its outer end portion a convex spherically-shaped face 19 which extends outwardly beyond the seat 15. These convex portions are preferably centerless-ground to facilitate free relative movements without injury to the engaging spherical faces under service conditions. Between the two portions the head is preferably not shaped spherically and is accordingly spaced from the sleeve. The sleeve 9, inward of the seat 12, is spaced from the staybolt, and, likewise, the ring 11 and sleeve 9' of Fig. 2, inward of the seat 12', are spaced from the bolt 6'.

The sleeve 9 is provided with a removable cap 20 having an interior pressure face 21 disposed opposite to the seat 15, a hollow interior portion or dome 22 disposed outwardly beyond the pressure face 21, and an internally threaded portion 23 disposed inwardly of the pressure face 21, the threads of portion 23 engaging the threads of portion 16. The cap has an orifice 24 in line with the bore or tell-tale hole 13 so that the tell-tale bore 13 may be cleaned out through this orifice and so that any fracture of the staybolt will be indicated by leakage of steam or water passing through the fracture into the bore and therefrom through the orifice 24. The bore 13' of Fig. 2 operates in a similar manner except that it may be cleaned from either end, as aforesaid, and the indication of a fracture may be noted at either end.

Execpt for the modification involving the ring 11, the constructions thus far described are conventional.

The invention comprises an annular gasket 25, which is preferably made of copper, and a spring clamp 26 which is made of steel tempered to withstand the heat of the boiler steam. The hollow portion or dome 22 has a more or less bowl-shaped face 27, and in this dome projects the upper portion of the head 17 having the convex face 19. The upper portion of the head is separated from the face 27 by a space 28.

The gasket 25 has a flange 29 supported on the seat 15 and the spring clamp 26 has a flange 30 supported on the flange 29 and engaged by the pressure face 21 when the cap is screwed home, the flanges being thereby tightly held in place. The gasket is pre-shaped to provide a concavo-convex portion 31 extending from its central orifice to its flange and disposed in the space 28 with its concave face snugly engaging the convex face 19.

The spring clamp 26 is made from thin sheet steel cut to form a disc having a central orifice and a circular row of radial slits extending from the orifice toward the periphery of the disc. The disc is then shaped to provide the flange 30 for the spring clamp and a concavo-convex portion 32, the orifice in the disc being thereby enlarged to provide the orifice 33, and the slits are thereby opened at the orifice providing V-shaped slits 34. The clamp in this form is then tempered to a proper degree to withstand the steam temperature of the boiler. A row of concavo-convex spring fingers 35, separated by the open slits 34, is thus provided.

The concavo-convex portion 32, when the spring clamp is assembled, extends from adjacent the inside periphery of the flange 29 of gasket 25 toward the orifice 24 of the cap 20. When the cap 20 is but partly screwed on the sleeve the convex faces of the fingers 35 adjacent the orifice 33 engage the face 27 near the orifice 24 of the cap, thereby crossing the space 28, the orifice 33 being in line with the orifice 24 and bore 13. When the cap is screwed home the flanges 29 and 30 are tightly secured in place as aforesaid, and the fingers 35 are compressed to sufficiently tension them to provide an adequate clamping pressure upon the convex face of the gasket by the concave faces of the fingers adjacent thereto to provide of the gasket a flexibly sealed joint between the head 17 and sleeve 9. That is to say, the portions of the fingers 35 adjacent the flange 30 press the portion 31 of the gasket against the staybolt head 17.

When the cap is screwed tightly home the fingers, except where they engage the face 27, as aforesaid, are spaced from this face and are likewise spaced from the head beyond the gasket 25.

It will be seen that the gasket and spring clamp of the construction, as thus described, permits the bolt to expand and to move or tilt relative to the sleeve as service conditions require while at the same time maintaining a sealed joint between the staybolt and sleeve.

While there have been hereinbefore described approved embodiments of this invention, it will be understood that many and various changes and modifications in form, arrangement of parts and details of construction thereof may be made without departing from the spirit of the invention, and that all such changes and modifications as fall within the scope of the appended claims are contemplated as a part of this invention.

The invention claimed and desired to be secured by Letters Patent is:

1. A flexible staybolt construction comprising a staybolt having a head at the outer end thereof with inner and outer spherical faces and a tell-tale hole opening through said head; and means cooperating with said head providing a flexible connection for securing said staybolt to the outer sheet of a boiler including a sleeve adapted to be secured at an orifice in said boiler sheet having a spherical seat engaging said head inner spherical face, a cap screwed on said sleeve having an orifice in line with said tell-tale hole and a dome disposed outwardly from said sleeve, said head at its said outer spherical face being housed in said dome with a space therebetween, a gasket having a flange and an outwardly extending concavo-convex spherical portion, its concave face snugly

fitting upon said head outer spherical face, and a clamp having a flange, said flanges being secured between said sleeve and cap, said clamp further having an outwardly extending compressible concavo-convex spherical spring portion provided with an orifice in line with said tell-tale hole with its concave face adjacent its said flange in pressure engagement upon the convex face of said gasket portion and its convex face adjacent its orifice in pressed engagement with the inner face of said dome, said spring portion being energized by said cap when said cap is screwed home.

2. A flexible staybolt construction comprising a staybolt having a head at the outer end thereof with inner and outer spherical faces and a tell-tale hole opening through said head; and means cooperating with said head providing a flexible connection for securing said staybolt to the outer sheet of a boiler including a sleeve adapted to be secured at an orifice in said boiler sheet having a spherical seat engaging said head inner spherical face, a cap screwed on said sleeve having an orifice in line with said tell-tale hole and a dome disposed outwardly from said sleeve, said head at its said outer spherical face being housed in said dome with a space therebetween, a gasket having a flange and an outwardly extending concavo-convex spherical portion, its concave face snugly fitting upon said head outer spherical face, and a clamp having a flange, said flanges being secured between said sleeve and cap, said clamp further having an outwardly extending compressible concavo-convex spherical spring portion provided with an orifice in line with said tell-tale hole with its concave face adjacent its said flange in pressure engagement upon the convex face of said gasket portion, said clamp portion being provided with a circular row of spring fingers extending from said clamp orifice toward said clamp flange with their free ends in pressed engagement with the inner face of said dome, said spring portion being energized by said cap when said cap is screwed home.

3. A flexible staybolt construction comprising a staybolt having a head at the outer end thereof with inner and outer spherical faces and a tell-tale hole opening through said head; and means cooperating with said head providing a flexible connection for securing said staybolt to the outer sheet of a boiler including a sleeve adapted to be secured at an orifice in said boiler sheet having a spherical seat engaging said head inner spherical face, a cap screwed on said sleeve having an orifice in line with said tell-tale hole and a dome disposed outwardly from said sleeve, said head at its said outer spherical face being housed in said dome with a space therebetween, a gasket having a flange and an outwardly extending concavo-convex spherical portion, its concave face snugly fitting upon said head outer spherical face, and a clamp having a flange, said flanges being secured between said sleeve and cap, said clamp further having an outwardly extending compressible concavo-convex spherical spring portion provided with an orifice in line with said tell-tale hole with its concave face adjacent its said flange in pressure engagement upon the convex face of said gasket portion, said clamp portion being provided with a circular row of spring fingers extending from said clamp orifice toward said clamp flange with their free ends in pressed engagement with the inner face of said dome, said clamp portion from said finger-engaged ends on its outer face to said clamp flange, and on its inner face to said gasket portion, being spaced respectively from said dome and said head, said spring portion being energized by said cap when said cap is screwed home.

4. A flexible staybolt construction comprising a staybolt having a head at the outer end thereof with inner and outer spherical faces and a tell-tale hole opening through said head; and means cooperating with said head providing a flexible connection for securing said staybolt to the outer sheet of a boiler including a sleeve adapted to be secured at an orifice in said boiler sheet, a ring-shaped insert seated in said sleeve having a spherical seat at its top engaging said head inner spherical face for raising the upper portion of said head above said sleeve, a cap screwed on said sleeve having an orifice in line with said tell-tale hole and a dome disposed outwardly from said sleeve, said head at its said outer spherical face being housed in said dome with a space therebetween, a gasket having a flange and an outwardly extending concavo-convex spherical portion, its concave face snugly fitting upon said head outer spherical face, and a clamp having a flange, said flanges being secured between said sleeve and cap, said clamp further having an outwardly extending compressible concavo-convex spherical spring portion provided with an orifice in line with said tell-tale hole with its concave face adjacent its said flange in pressure engagement upon the convex face of said gasket portion, said clamp portion being provided with a circular row of spring fingers extending from said clamp orifice toward said clamp flange with their free ends in pressed engagement with the inner face of said dome, said clamp portion from said finger-engaged ends on its outer face to said clamp flange, and on its inner face to said gasket portion, being spaced respectively from said dome and said head, said spring portion being energized by said cap when said cap is screwed home.

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